a pressure side tip wall disposed at said tip extending from said leading edge to said trailing edge, said pressure side tip wall being offset from said pressure side wall so as to define a tip shelf and having at least one rib extending therefrom; and

an outer tip wall disposed on said pressure side of said tip in spaced apart relationship with said pressure side tip wall and attached to said at least one rib, said outer tip wall comprising a high temperature foil.

9. The airfoil of claim 8 further comprising an interface layer disposed between said at least one rib and said outer tip wall.

REMARKS

This application has been carefully reviewed in light of the Office Action dated December 24, 2002. By way of this amendment, claim 3 has been canceled, and claims 1, 4, 7 and 9 have been amended. Minor corrections to the specification have been made. Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached paper is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE." Claims 1, 2 and 4-12 are currently pending in the application. Applicant hereby requests further examination and reconsideration in view of the following remarks.

The Examiner has objected to the drawings as failing to comply with 37 CFR 1.84(p)(5) because the reference character "A" is not found in the drawings. In response, applicant has amended the specification to remove the sole mention of reference character "A." It is submitted that this amendment overcomes the objection to the drawings so that a change to the drawings is not required.

The Examiner has objected to the Abstract. In response, applicant has amended the Abstract to remove the objectionable language. It is submitted that this amendment overcomes the objection to the Abstract.

The Examiner has objected to certain informalities in claims 1, 3, 7 and 9. In response, claims 1, 7 and 9 have been amended in the manner suggested by the Examiner, and claim 3 has been canceled. Accordingly, it is submitted that the objections to the claims have been overcome.

The Examiner has rejected claims 1 and 7 under 35 U.S.C. § 102(b) as being anticipated by Andersen, claim 1 under 35 U.S.C. § 102(b) as being anticipated by Japanese Patent 1-53002, and claims 1 and 6 under 35 U.S.C. § 102(b) as being anticipated by Jackson. These grounds of rejection are respectfully traversed.

Independent claim 1 recites an airfoil having first and second walls, with the second wall having at least one rib extending therefrom. An outer wall comprising a high temperature foil is attached to the at least one rib in spaced apart relationship with the second wall. Claim 1 has been amended to recite that an interface layer is disposed between the at least one rib and the outer wall. Independent claim 7 recites an airfoil having a suction side tip wall and a pressure side tip wall. The pressure side tip wall defines a tip shelf and has at least one rib extending therefrom. An outer tip wall comprising a high temperature foil is attached to the at least one rib in spaced apart relationship with the pressure side tip wall.

Andersen discloses an airfoil having a thin sheet metal sleeve 58 surrounding the airfoil tip. The sleeve 58 is bonded to ribs 55 formed in the airfoil by brazing or welding. However, Andersen fails to disclose an outer wall comprising a high temperature foil as required by claims 1 and 7. Specifically, there is no suggestion that the metal sleeve 58 of Andersen comprises a "high temperature foil" as that term is defined in the present specification. The

Examiner states that the metal sleeve 58 is a high temperature foil because it is inherently capable of withstanding high temperatures that occur in a gas turbine engine. However, the term "high temperature foil" contemplates much more than something that is simply capable of withstanding high temperature. The present specification indicates that the term "high temperature foil" refers to a structure that is made from an alloy having improved strength and oxidation resistance over conventional superalloys at temperatures above 1093^{0}C (2000^{0}F), and capable of being formed to a thickness of about 0.51 mm (0.020 in.) or less (see paragraph 0014). There is nothing in the Andersen patent to suggest that the metal sleeve 58 meets all of these characteristics, even assuming that it is capable of withstanding high temperatures. Accordingly, it is respectfully submitted that Andersen fails to anticipate claims 1 and 7.

The Japanese patent discloses a turbine blade 1 having a plurality of grooves 2 formed therein. A covering material 3 is joined to the surface of the turbine blade 1 to cover the grooves 2. However, there is no suggestion that the covering material 3 is comprised of a "high temperature foil." The Japanese patent merely describes this as a covering material that is joined to the surface of the turbine blade to cover the grooves and does not specify any particular characteristics of the covering material. Even assuming that the covering material is inherently capable of withstanding high temperatures, there is insufficient disclosure to suggest that the covering material 3 comprises a "high temperature foil" as that term is defined in the present specification. Moreover, the Japanese patent does not disclose an interface layer disposed between at least one rib and the outer wall (i.e., the covering material) as now required by claim 1. Accordingly, it is respectfully submitted that the Japanese patent fails to anticipate claim 1.

Jackson discloses an airfoil comprising a partially hollow airfoil support wall 40 and an airfoil skin 42. The Examiner contends that the airfoil skin

42 corresponds to the claimed outer wall. However, applicant respectfully submits that Jackson does not disclose an interface layer disposed between at least one rib and the outer wall (i.e., airfoil skin 42) as now required by claim 1. Furthermore, it would not have been obvious to modify Jackson to include an interface layer. Lines 51-52 in column 7 of Jackson state that it is "essential" that airfoil skin 42 be metallurgically bonded to airfoil support wall 40. Use of an interface layer would prevent airfoil skin 42 from being directly metallurgically bonded to airfoil support wall 40. Thus, Jackson teaches away from adding an interface layer. Accordingly, it is respectfully submitted that the Jackson fails to anticipate claim 1. Claim 6, which depends form claim 1, is also believed to be allowable.

The Examiner has rejected claims 2, 3, 8 and 9 under 35 U.S.C. § 103(a) as being unpatentable over Andersen in view of Chandley. This ground of rejection is respectfully traversed.

The Examiner relies on Chandley for teaching an airfoil having a shield 28 comprising a platinum/rhodium alloy and asserts that it would have been obvious to form the airfoil of Andersen such that the metal sleeve 58 comprised a platinum/rhodium alloy as taught by Chandley. However, even if the metal sleeve 58 were modified to be made of a platinum/rhodium alloy, there is still no teaching in the prior art that the metal sleeve 58 would be a "high temperature foil" as that term is defined in the present specification. The modified metal sleeve 58 would not have all of the characteristics (particularly the thickness characteristics) of a high temperature foil as set forth in the present specification. Accordingly, the combination of Andersen and Chandley would not render claims 1 and 7 unpatentable for failure to suggest the claimed high temperature foil. Claims 2, 3, 8 and 9, which depend from claim 1 or 7, are thus also not rendered unpatentable.

The Examiner has rejected claim 2 under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent 1-53002 in view of Chandley and claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent 1-53002 in view of Chandley and further in view of Andersen. These grounds of rejection are respectfully traversed.

Applicant submits that the combination of the Japanese patent and Chandley would not render claim 2 unpatentable for the same reasons set forth above with respect to the combination of Andersen and Chandley. In other words, even if the Japanese patent were modified so that the covering material 3 comprised a platinum/rhodium alloy, the covering material would still not have all of the characteristics of a high temperature foil as set forth in the present specification. For instance, there would be no suggestion that the covering material would have a thickness of about 0.51 mm (0.020 in.) or less. Similarly, claim 3 is not rendered unpatentable because even if modified to include an interface layer, the combination would still lack a true high temperature foil.

The Examiner has rejected claim 6 under 35 U.S.C. § 103(a) as being unpatentable over either Andersen or Japanese Patent 1-53002 in view of Craig and claim 12 under 35 U.S.C. § 103(a) as being unpatentable over Andersen in view of Craig. These grounds of rejection are respectfully traversed.

The Examiner relies on Craig for a showing of a turbine blade shell made of a nickel-based alloy. Even assuming that it would have been obvious to modify Andersen to make the metal sleeve 58 of a nickel-based alloy or to modify the Japanese patent to make the covering material 3 of a nickel-based alloy, the resulting combinations would still lack a "high temperature foil" as that term is defined in the present specification. The modified metal sleeve 58 and the modified covering material 3 would not have all of the characteristics (particularly the thickness characteristics) of a high temperature foil as set forth in the present specification. Accordingly, the proposed combinations would not render claims 1

and 7 unpatentable for failure to suggest the claimed high temperature foil. Claims 6 and 12 depend from claims 1 and 7, respectively, and are thus also not rendered unpatentable.

In view of the above, it is submitted that the claims are in condition for allowance. Reconsideration of the objections and rejections is requested. Allowance of claims 1, 2 and 4-12 at an early date is solicited.

Respectfully submitted,

4/23/03
Date

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The Abstract has been amended as follows:

[The present invention provides an] An airfoil body having a first wall including a plurality of ribs. An outer wall formed of a high temperature foil is attached to the ribs so as to form a plurality of channels. The first wall is protected from hot flowpath gases by the outer wall and by cooling air flowing through the channels.

Paragraph 0027 beginning on page 9 has been amended as follows:

The wall 62, ribs 64, and outer wall 68 cooperate to define one or more channels 70. The wall 62 thus has a first side exposed to an internal cavity 72 or a source of cooling air, a second side exposed to the flow of cooling air through the channel 70[, as shown by the arrow marked A]. The outer wall 68 has a first side exposed to the flow of cooling air through the channel 70 and a second side exposed to hot gas flowpath 74.

IN THE CLAIMS:

Claims 1, 4, 7 and 9 have been amended as follows:

1 (once amended). An airfoil comprising:

an airfoil body having a root, a tip, a leading edge, and a trailing edge;

a first wall extending from said leading edge to said trailing edge;

a second wall extending from said leading edge to said trailing edge, said second wall having at least one rib extending therefrom; [and]

an outer wall disposed in spaced apart relationship with said second wall and attached to said at least one rib, said outer wall comprising a high temperature foil; and

an interface layer disposed between said at least one rib and said outer wall.

4 (once amended). The airfoil of claim [3] 1 wherein said interface layer comprises chromium, palladium, and nickel.

7 (once amended). An airfoil comprising:

an airfoil body having a root, a tip, a leading edge, a trailing edge, a pressure side wall and a suction side wall;

a suction side tip wall disposed at said tip and extending from said leading edge to said trailing edge;

a pressure side tip wall disposed at said tip extending from said leading edge to said trailing edge, said pressure side tip wall being offset from said pressure side wall so as to define a tip shelf and having at least one rib extending therefrom; and

an outer tip wall disposed on said pressure side of said tip in spaced apart relationship with said pressure side tip wall and attached to said at least one rib, said outer tip wall comprising a high temperature foil.

9 (once amended). The airfoil of claim 8 further comprising an interface layer disposed between said at least one rib and said outer tip wall.